Critique of the Capabilities of the Field Artillery Battalion (8", SP) To Accomplish its Nuclear Mission.

John E. Robbins, MAJ, USA
U. S. Army Command and General Staff College
Fort Leavenworth, Kansas 66027

Final report, 11 June 1976

72p.

A Master of Military Art and Science thesis presented to the Faculty of the U. S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027

Re: Classified reference

Statement A should not be changed per Ms. Jan Buffo.

JCC
8/2/76

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)

Critique of the Capabilities of the Field Artillery Battalion (8", SP) To Accomplish Its Nuclear Mission

5. TYPE OF REPORT & PERIOD COVERED

Final Report 11 June 1976

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)

Robbins, John E., MAJ, USA

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS

Student at the U. S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS

US Army Command and General Staff College
ATTN: ATSW-SE

12. REPORT DATE

11 June 76

13. NUMBER OF PAGES

62

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)

15. SECURITY CLASS. (of this report)

Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Master of Military Art and Science (MMAS) thesis prepared at CGSC in partial fulfillment of the Masters Program requirements, U. S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This research examines the capabilities of the field artillery battalion (8" SP) to accomplish its nuclear mission. A typical European scenario is used as a vehicle for analysis of the present battalion organization and two alternate battalion organizations. This scenario envisions a massive attack by an aggressor force in an area defended by a U. S. division. Twenty-six hours after the attack begins, nuclear release is received for the division sub-package with a sixty minute pulse beginning four hours later.

The three battalion organizations are analyzed for their ability to survey, compute the firing data, communicate, transport, assemble and fire the nuclear weapons. Only one of the battalion organizations is found to be adequate; however, it does not make the most efficient use of men and materiel. Neither of the other two battalion organizations can perform the complete nuclear mission.

Utilizing a combination of the present organization and the organization which can accomplish its nuclear mission an optimal organization is proposed. This organization retains the sub-elements in the present organization that can adequately perform their tasks related to the nuclear mission and modifies the sub-elements that are found to be inadequate. The resulting battalion organization has one less individual, the same number of vehicles, and a few additional items of equipment.

CRITIQUE OF THE CAPABILITIES OF THE

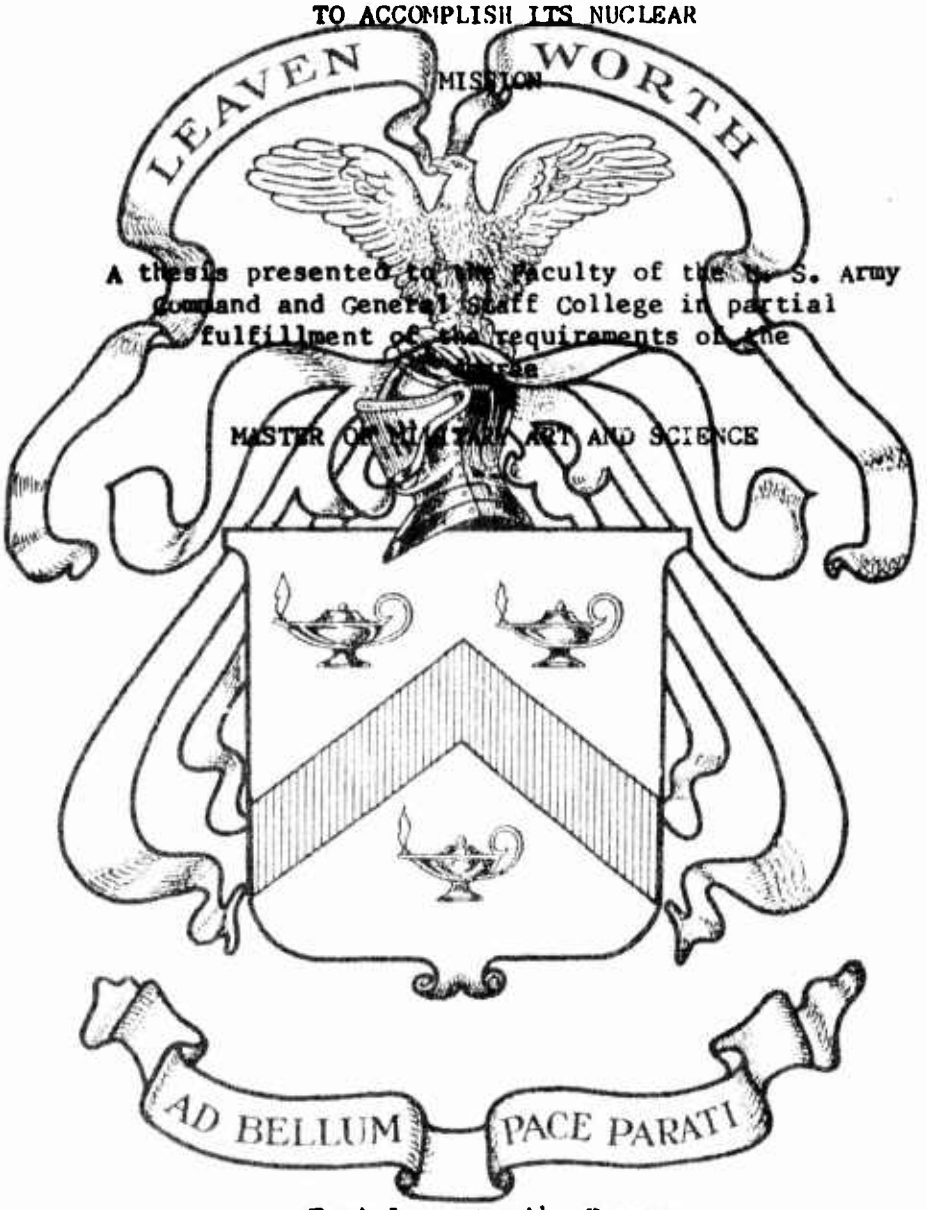
FIELD ARTILLERY BATTALION (8", SP)

TO ACCOMPLISH ITS NUCLEAR

MISSION

A thesis presented to the Faculty of the U. S. Army
Command and General Staff College in partial
fulfillment of the requirements of the
course

MASTER OF MILITARY ART AND SCIENCE



Fort Leavenworth, Kansas
1976

CRITIQUE OF THE CAPABILITIES OF THE FIELD ARTILLERY BATTALION (8", SP) TO ACCOMPLISH ITS NUCLEAR MISSION

A thesis presented to the Faculty of the U. S. Army Command and General Staff College in partial fulfillment of the requirements of the degree

MASTER OF MILITARY ART AND SCIENCE

by

JOHN E. ROBBINS, MAJ, USA
B. S., Mississippi State University, 1964

Fort Leavenworth, Kansas
1976

MASTER OF MILITARY ART AND SCIENCE

THESIS APPROVAL PAGE

Name of candidate John E. Robbins, MAJ, USA

Title of thesis Critique of the Capabilities of the Field Artillery Battalion (8", SP) To Accomplish Its Nuclear Mission

Approved by:

________________, Research Advisor

________________, Member, Graduate Research Faculty

________________, Member, Graduate Research Faculty

________________, Member, Consulting Faculty

Accepted this 27th day of April 1976 by ________________, Director, Master of Military Art and Science.

ABSTRACT

This research examines the capabilities of the field artillery battalion (8", SP) to accomplish its nuclear mission. A typical European scenario is used as a vehicle for analysis of the present battalion organization and two alternate battalion organizations. This scenario envisions a massive attack by an aggressor force in an area defended by a U. S. division. Twenty-six hours after the attack begins, nuclear release is received for the division sub-package with a sixty minute pulse beginning four hours later.

The three battalion organizations are analyzed for their ability to survey, compute the firing data, communicate, transport, assemble and fire the nuclear weapons. Only one of the battalion organizations is found to be adequate; however, it does not make the most efficient use of men and materiel. Neither of the other two battalion organizations can perform the complete nuclear mission.

Utilizing a combination of the present organization and the organization which can accomplish its nuclear mission, an optimal organization is proposed. This organization retains the sub-elements in the present organization that can adequately perform their tasks related to the nuclear mission and modifies the sub-elements that are found to be inadequate. The resulting battalion organization has one less individual, the same number of vehicles, and a few additional items of equipment.

TABLE OF CONTENTS

ABSTRACT i

LIST OF TABLES iii

CHAPTER

I. PLAN 1

II. REQUIREMENTS FOR MISSION ACCOMPLISHMENT 6
Introduction
Headquarters and Headquarters Battery
Service Battery
Field Artillery Batteries (8", SP)
Summary

III. METHODOLOGY 27
Introduction
Scenario
Deployment of Units

IV. RESULTS 34
Introduction
Assembly of Nuclear Weapons
Survey
Computation of Firing Data
Transportation of Nuclear Ammunition
Communications
Firing the Nuclear Weapons
Evaluation

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS 50
Summary
Conclusions
Recommendations

NOTES 54

BIBLIOGRAPHY 60

LIST OF TABLES

Table		Page
II-1.	Field Artillery Battalion (8", SP).	13
II-2.	Hq & Hq Btry, Field Artillery Battalion (8", SP). . . .	14
II-3.	Battalion Operations-Fire Direction Section	15
II-4.	Battalion Survey Section	16
II-5.	Battalion Communications Platoon	17
II-6.	Svc Btry, Field Artillery Battalion (8", SP).	18
II-7.	Service Battery Ammunition Trains	19
II-8.	Field Artillery Battery (8", SP)	20
II-9.	Field Artillery Battery Survey Party.	21
II-10.	FA Battery Communications Element	22
II-11.	FA Battery Ammunition Section	23
II-12.	FA Battery Howitzer Section	24
II-13.	FA Battery Fire Direction Center.	25
II-14.	FA Battery Special Weapons Section.	26
III-1.	Situation--Front Line Trace	31
III-2.	Target Array.	32
III-3.	Deployment of Units	33
IV-1.	Nuclear Weapons Assembly Capabilities	45
IV-2.	Survey Capabilities	46
IV-3.	Communications	47
IV-4.	Firing the Nuclear Weapons.	48
IV-5.	Evaluation of Capabilities.	49
V-1.	Recommendations for Changes to TOE's.	53

CHAPTER I

PLAN

Introduction

The basic mission of the field artillery is to provide continuous and timely fire support to the maneuver forces.[1] The fire support provided by the field artillery battalion (8",SP) under Table of Organization and Equipment (TOE) 6-395H includes the capabilities for delivering both conventional and nuclear fires in general support of the armored and infantry (mech) divisions or for reinforcing the fires of other artillery units.[2]

With the introduction of the current tactical nuclear doctrine, it is even more important that the capabilities of the field artillery battalion (8", SP) TOE 6-395H to deliver nuclear fires be determined and improved if required. Since a battalion with this TOE is the only eight-inch battalion organic to the armored and infantry (mech) divisions,[3] it will probably be designated as a nuclear fire unit which will respond to division artillery control upon release of nuclear weapons for delivery by division means.[4]

Problem Statement

What modifications, if any, to the TOE will significantly increase the capabilities of the field artillery battalion (8", SP) TOE 6-395H to accomplish its nuclear mission?

Terms

Package--A discrete grouping of nuclear weapons by specific yields for employment in a specified area during a short time period to support a corps tactical contingency.[5]

Prefire--Operations performed just prior to firing a nuclear weapon when the weapon has been transported to the howitzer. These operations include setting and installing the fuze into the projectile.

Pulse--The effect achieved by limiting the time for employment of nuclear weapons.[6]

Stockpile Configuration--The status of the nuclear components of an M 422 (the 8" atomic weapon) which requires a complete assembly operation prior to firing the projectile.

Sub-package--A division or lower echelon grouping of weapons which are a part of the Corps package.[7]

Target Array--A graphic representation of enemy forces, personnel, and facilities in a specific situation, accompanied by a target analysis.[8]

Timeframe--The period of time during which the Corps foresees the need for a package of nuclear weapons. The timeframe may vary from several hours to a day or more.[9]

Timespan--A shorter length of time (normally 30 to 120 minutes) within the timeframe when nuclear weapons are actually employed.[10]

Yield--The amount of energy released by a nuclear weapon. It is usually measured in kilotons (kt) or megatons (mt) which indicate the number of tons (X1000 or X1000000 respectively) of TNT to produce a conventional explosion of the same energy.[11]

Rationale

Current tactical nuclear doctrine specifies how nuclear weapons will be employed under the constraints of the National Command Authority (NCA). These constraints will normally be specified as follows: number and size of weapons to be employed, area of employment, timeframe and timespan for employment, and collateral damage preclusions.[12] Release of a nuclear weapons package will be requested by Corps who specifies the above parameters; however, the package as released may be modified by the NCA.[13]

The constraints placed on the employment of a nuclear weapons package will have a direct impact on the nuclear delivery requirements placed on the field artillery battalion (8", SP). By changing one or more of the constraints, the number, size, designated ground zero, and time required for delivery could be changed. Therefore, the nuclear doctrine requires that the battalion be capable of reacting rapidly to performing its mission within the constraints imposed by the NCA in a released package of nuclear weapons.

Assumptions

1. That nuclear weapons will be in stockpile configuration upon receipt of the nuclear release.

2. That the timespan will be sixty minutes.

3. That the time from receipt of nuclear release to the beginning of the pulse will be four hours.

4. That no unit (battery or section) will remain in position longer than ten minutes after it fires its first nuclear weapon, and that it will displace a minimum of one kilometer.

Scope

This study will analyze the battalion and its sub-elements that have a direct effect on nuclear delivery capabilities. If elements are found to be weak and detract from nuclear mission accomplishment, they will be strengthened by additional personnel and/or equipment in order to maximize their nuclear mission accomplishment. The elements that have a direct effect on nuclear mission accomplishment are discussed in Chapter II.

Methodology

To determine the capability of the field artillery battalion (8", SP) TOE 6-395H to perform its nuclear mission, an anticipated typical target array that would be engaged by a division sub-package in Central Europe will be used as the vehicle. A battalion as presently organized will be deployed and the number of nuclear targets within the target array that the battalion can engage will be determined. Two modified battalions will then be compared utilizing the same target array to determine if modifications to the TOE have significantly improved the battalion's nuclear capability.

The analysis will be made on the ability of the battalions to accomplish the following: assemble the nuclear weapon, survey the firing positions, compute the firing data, transport the nuclear ammunition, communicate, and fire the nuclear ammunition. The battalion as presently organized will be analyzed to determine the sub-elements that adversely affect mission accomplishment. These weak sub-elements will be strengthened by additional personnel, equipment, and/or re-organized in the development of the two modified battalions.

Thesis Organization

The thesis is organized into five chapters. Chapter II discusses the battalion and its sub-elements that have a direct effect on the accomplishment of the nuclear mission. Also, alternative battalion organizations are discussed. Chapter III details the methods used, including the target array.

The advantages and disadvantages of each battalion organization are contained in Chapter IV. Finally, Chapter V draws conclusions and makes recommendations based on this research.

CHAPTER II

REQUIREMENTS FOR MISSION ACCOMPLISHMENT

Introduction

This chapter discusses the sub-elements within the battalion as presently organized and the modifications to the sub-elements to form the two alternate battalions (A and B). The basic battalion is presently organized with a headquarters and headquarters battery (HHB), a service battery (Sv Btry), and three field artillery batteries (FA Btry).[1] See Table II-1. Changes for the modified battalions are discussed in each section.

Headquarters and Headquarters Battery

The headquarters and headquarters battery (HHB) is organized as shown in Table II-2. The sub-elements within headquarters and headquarters battery that have a direct effect on the accomplishment of the nuclear mission are: the operations and fire direction section (OP/FD Sec), the survey section, and the communications platoon. In the alternate battalions, the basic organization of the HHB will not be changed; however, some of the sub-elements may be modified.

Operations and Fire Direction Section (Table II-3)

Since the battalion or its FA batteries when assigned as a nuclear fire unit will be responding directly to division artillery for release of nuclear weapons,[2] the function of the operations and fire

direction section (OP/FD Sec) will be to provide technical fire control which is the conversion of target data into firing data and fire commands.[3] The technical fire control provided by the OP/FD Sec serves as a check and backup to the fire direction centers (FDC) of each FA battery.

In the A and B organizations the OP/FD Sec has been strengthened with additional personnel required for continuous operation of the section. Also, a radio (AN/VRC 46) and a radio set control group (AN/GRA 39) are added so that each carrier command post (M 577) can be used as an FDC when displacing the HHB. Two fire direction sets and two plotting boards are added to give a dual capability to FDC equipment.

Survey Section (Table II-4)

The primary mission of the battalion survey section is to provide timely accurate survey control to the FA batteries within the battalion.[4] The survey section is capable of providing fourth order survey (accuracy 1:3000) for the battalion.[5] The battalion recon-survey officer is responsible for coordinating and planning the survey conducted by his party as well as coordinating the surveys conducted by the parties in the FA batteries.

Type A organization centralizes all the survey capabilities at battalion by forming two additional parties in the battalion survey section. This organization will remove the survey capability from the FA batteries.

Type B organization remains the same as the present organization at battalion level, but the FA battery survey parties are modified in the B organization.

Communications Platoon (Table II-5)

The communications platoon is capable of providing wire, AM and FM radio, and courier communications with higher, lower, and adjacent units. With the increased division frontage and potential enemy capability to employ electronic counter-measures (ECM), it is necessary that the battalion have dual means of communicating with the FA batteries.

In organization A, additional FM radios insure the capability of establishing two radio relay sites. This insures a backup to the existing AM radio capabilities within the battalion.

Organization B has an additional wire team in the wire section that gives the platoon the capability of laying wire to all three FA batteries simultaneously.

Service Battery (Table II-6)

The only element within service battery that has an effect on the nuclear capabilities of the battalion is the ammunition trains (Table II-7). The organization of the ammunition trains includes a headquarters element and three ammunition sections. Four individuals within the ammunition trains have an additional skill identifier (ASI) of R-3.[6] These individuals provide physical security of nuclear weapons during movement and storage.[7]

The ammunition trains element in organization A remains as presently organized. The special weapons elements within the FA batteries are supplemented to increase their capabilities.

Organization B moves all special weapons personnel and equipment to the ammunition trains and adds personnel and equipment to the existing organization. This organization provides a position for a

special weapons officer in the ammunition trains as well as providing AM communications capabilities with the battalion.

Field Artillery Batteries (8" SP)

The battalion is organized with three identical field artillery batteries (8", SP). See Table II-8. Within each of the FA batteries, the following elements play a significant role in nuclear mission accomplishment: survey party, communications element, ammunition section, howitzer sections, fire direction center, and the special weapons element.

Survey Party (Table II-9)

The survey party in each battery is capable of providing fourth order survey (accuracy 1:3000)[8] from the survey control point (SCP) established by the battalion survey section to the primary and alternate firing positions for the battery. The establishment of survey control to the firing positions enhances the accuracy of the artillery fires delivered by a unit.

Organization A eliminates the survey party located at the battery level and increases the survey capability at battalion level. In the B organization, the survey capability at battery level is improved by adding the distance measuring equipment and personnel necessary to eliminate the requirement to tape all distances.

Communications Element (Table II-10)

The communications element within each battery is capable of providing radio and wire communications for the battery. If the battery is to use alternate positions for firing nuclear weapons, the commun-

ications element is responsible for establishing wire communications with those alternate positions. It is also responsible for the installation of wire within the battery position.

In both A and B organizations the efficiency of this element has been improved by adding equipment and personnel to the wire team. The existing AM radio system is not changed.

Ammunition Section (Table II-11)

The ammunition section provides the transportation assets for the movement of the nuclear weapons as well as the transportation of conventional ammunition. The section also provides security for the nuclear weapons with the help of other sections in the battery as designated by the battery commander.[9]

Organization A reflects the addition of personnel and equipment to give this section additional load carrying capability. Since the special weapons capability has been moved to service battery in organization B, the ammunition section will remain the same as presently organized.

Howitzer Sections (Table II-12)

Each FA battery has four howitzer sections equipped with the howitzer heavy self-propelled (8") and a carrier cargo (tracked 6 ton). Each section chief has assets to provide physical security during transportation and storage of nuclear weapons.[10] His duties include supervision of the howitzer section and insuring that all tasks are properly executed within the section.[11] The duties performed by the section during nuclear firing do not differ from the conventional duties

of the section. There are no modifications to the howitzer sections in either A or B organizations.

Fire Direction Center (Table II-13)

The fire direction center (FDC) determines the firing commands for the howitzer section. The gunnery techniques for computing firing data for the 8" nuclear round are the same as for conventional ammunition, with the exceptions of determining the fuze setting and adding ballistic corrections for the nuclear projectile.[12]

Both A and B organizations add personnel to the FDC to give it a twenty-four hour operation capability. In addition, a vehicle is added to give the capability of transporting the increased equipment and personnel.

Special Ammunition Element (Table II-14)

The assembler personnel in the special ammunition element have an M-5 ASI which makes them the only personnel in the battery qualified to assemble, disassemble, and prefire the 8" projectile.[13] As presently equipped, they have the ability to perform operations on one round at a time even though they have the personnel required for two operations.

Organization A is augmented with an additional vehicle to give the capability of conducting two operations simultaneously. In organization B, the special ammunition element is eliminated at the FA battery level with the mission being assumed by service battery.

Summary

Each of the elements discussed in this chapter affects the ability of the battalion to assemble the nuclear weapon, survey the

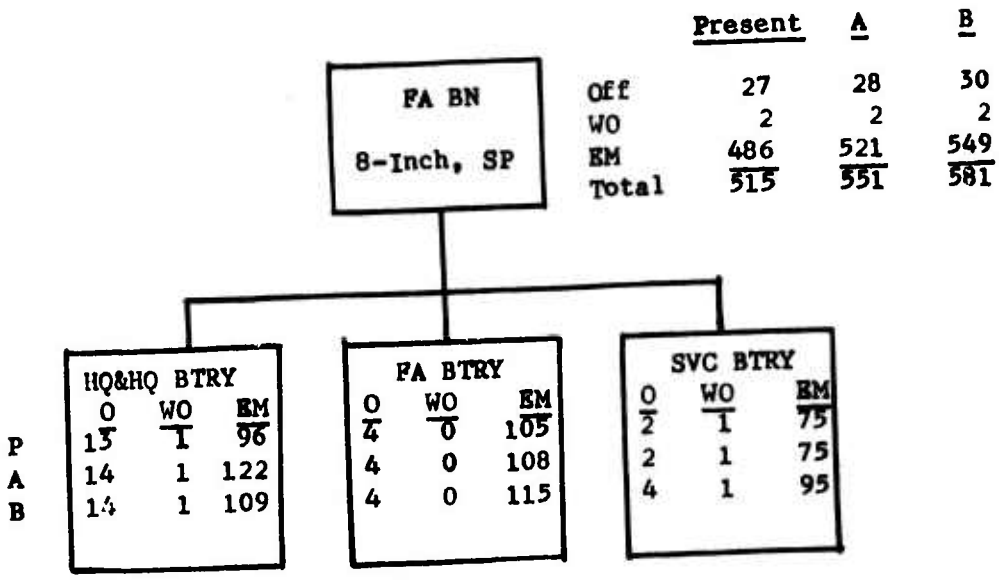
firing positions, compute the firing data, transport, and fire the nuclear ammunition. If any of these elements is not carried out in a timely manner, the efficiency of the nuclear mission will be adversely affected.

TABLE II-1[14]

TOE 6-395H

FIELD ARTILLERY BATTALION, 8-INCH, SELF-PROPELLED,

ARMORED OR INFANTRY (MECHANIZED) DIVISION



	Present	A	B
Off	27	28	30
WO	2	2	2
EM	486	521	549
Total	515	551	581

TABLE II-2[15]

TOE 6-396H

HEADQUARTERS AND HEADQUARTERS BATTERY, FIELD ARTILLERY BATTALION

8-INCH, SELF-PROPELLED, ARMORED/INFANTRY (MECHANIZED) DIVISION

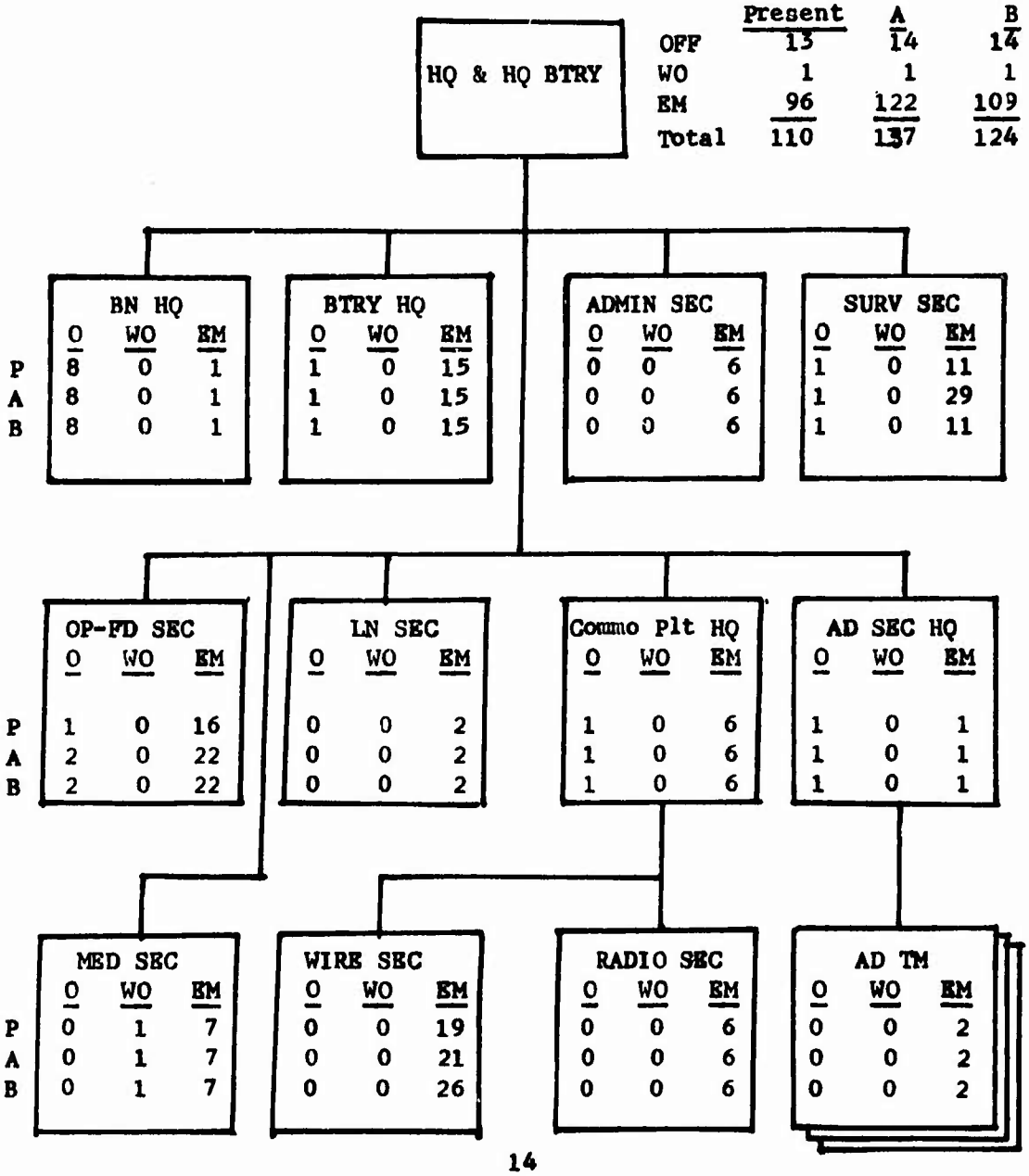


TABLE II-3[16]

BATTALION OPERATIONS-FIRE DIRECTION SECTION

Personnel

	Present	Type A&B
CPT (FDO)	1	1
Lt (Asst FDO)	0	1
E-8 (Intel Sgt)	1	1
E-8 (Op Sgt)	1	1
E-7 (Ch FD Cmpt)	1	1
E-6 (Asst Ch FD Cmpt)	1	1
E-5 (FD Cmpt)	4	8
E-4 (Chart Op)	2	4
E-4 (Op Sp)	1	1
E-4 (Clk Typist)	1	1
E-4 (Sr Fld Swbd Op)	2	2
E-4 (CP Carr Dvr)	1	1
E-3 (Dvr)	2	2

Equipment (Critical)

Carr CP M 577	5	6
An/VRC 46	5	6
AN/GRA 39	2	2
TSEC/KY-38	1	1
Computer, Gun Direction (FADAC)	4	6
Fire Direction Set, Arty, 25,000 meters	4	6
Plotting Board, Indirect Fire, Arty/Inf		

TABLE II-4[17]

BATTALION SURVEY SECTION

Personnel

	Present	Type A	Type B
Lt (Recon Survey Off)	1	1	1
E-7 (Chief Surveyor)	1	1	1
E-6 (Chief of Survey Party)	1	3	1
E-5 (Survey Cmpt)	2	6	2
E-4 (Instr Op)	3	9	3
E-4 (Survey Recorder) (Dvr)	3	9	3
E-3 (Dvr)	1	1	1

Equipment (Critical)

¼ Ton Trk	1	1	1
1¼ Ton Trk	2	6	2
AN/PRC 77	3	7	3
Altimeter, Surveying, 4,500 meters	3	9	3
Surveying Instrument, Az gyro	1	3	1
Surveying Instrument, Dist measure	3	9	3
Surveying Set, Arty Fire Control, 4th Order	1	3	1
Theodolite, Survey Direct, 0.2 mil	3	9	3

TABLE II-5[18]

BATTALION COMMUNICATIONS PLATOON

Personnel

	Present	Type A	Type B
Lt (Plt Ldr)	1	1	1
E-8 (Comm Ch)	1	1	1
E-6 (Wire Sec Ch)	1	1	1
E-5 (Sr FADAC Mech)	1	1	1
E-5 (Wire Team Ch)	3	3	4
E-5 (Radio Sec Ch)	1	1	1
E-5 (Radio TT Tm Ch)	1	1	1
E-4 (Radio TT Op)	4	4	4
E-4 (FADAC Mech)	1	1	1
E-4 (Sr Message Clk)	1	1	1
E-4 (Sr Fld Swbd Op)	1	1	1
E-3 (Fld Swbd Op)	2	2	2
E-4 (Sr Tac Wire Op Sp)	4	5	6
E-3 (Message Clk) (Dvr)	1	1	1
E-3 (Tac Wire Op Sp)	8	8	12
E-3 (Dvr)	1	2	1

Equipment (Critical)

¼ Ton Trk	2	3	2
1¼ Ton Trk	3	3	4
GRC-142/TSEC/KW-7/mounted on 1¼ Ton Trk	2	2	2
AN/VRC 49	1	2	1
AN/GRA-39	1	2	1
TSEC/Ky-38	1	2	1
Cable Assembly, Telephone, CX-162/G,1000ft	7	7	7
Cable, Telephone, WD 1/TT, DR-8, ¼ mi	15	15	15
Cable, Telephone, WD 1/TT, RL-159/U, 1 mi	35	35	40
Cable, Telephone, WD 1/TT, 2-Conductor	10	10	10
Reeling Machine, Cable, Hand, RL31	3	3	4
Reeling Machine, Cable, Hand RL 39	17	17	17

TABLE II-6[19]

TOE 6-399H

SERVICE BATTERY, FIELD ARTILLERY BATTALION,

8-INCH, SELF-PROPELLED, ARMORED/INFANTRY (MECHANIZED) DIVISION

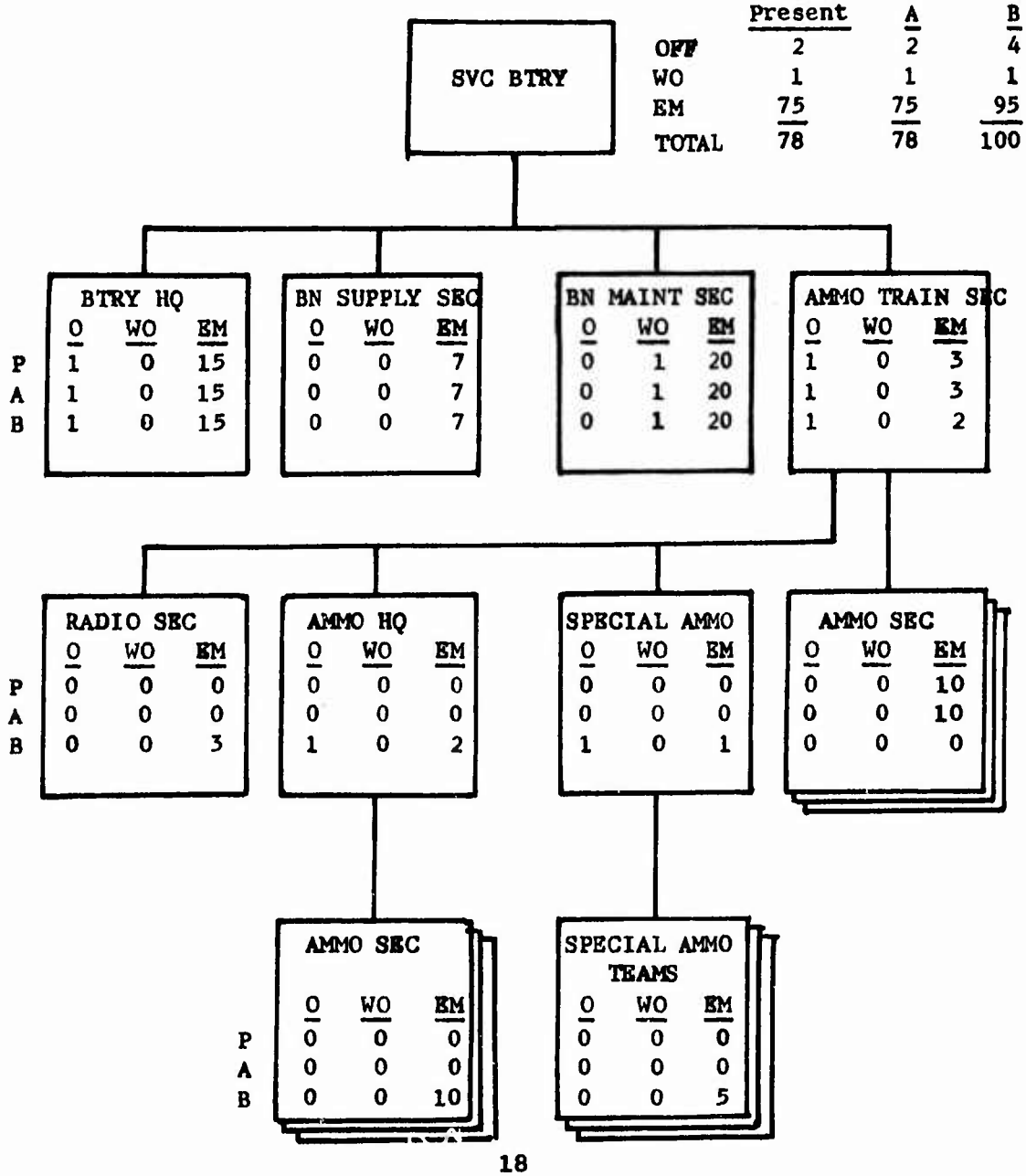


TABLE II-7[20]

SERVICE BATTERY AMMUNITION TRAINS

Personnel

	Present	Type A	Type B
CPT (Ammo Trains Cmdr)	0	0	1
Lt (Ammo Officer)	1	1	1
Lt (Special Weapon Off)	0	0	1
E-7 (Ammo Trains Chief)	0	0	1
E-6 (Ammo Supply Sgt)	1	1	1
E-6 (Ammo Sec Chief)	3	3	3
E-6 (Special Wpn Section Chief)	0	0	1
E-5 (Sr Hvy Veh Dvr)	3	3	3
E-5 (Special Wpn Team Chief)	0	0	3
E-5 (Radio TT Tm Chief)	0	0	1
E-4 (Special Wpn Assembler) (Dvr)	0	0	12
E-4 (Radio TT Op)	0	0	2
E-4 (Ammo Agent)	1	1	1
E-4 (Ammo Clk) (Dvr)	1	1	1
E-4 (Hvy Veh Dvr)	6	6	6
E-3 (Ammo Handler)	18	18	18

Equipment (Critical)

¼ Ton Trk	0	0	2
1¼ Ton Trk	1	1	1
GRC 142/TSEC/KW-7, mounted on 1¼ Ton Trk	0	0	1
Trk, 8 Ton M 520	9	9	9
Trk, 2½ Ton Van	0	0	6
AN/VRC 46	1	1	3
TSEC/KY-38	1	1	3

TABLE II-8[21]

TOE 6-397H

FIELD ARTILLERY BATTERY, 8-INCH, SELF-PROPELLED,

FIELD ARTILLERY BATTALION, ARMORED/INFANTRY (MECHANIZED) DIVISION

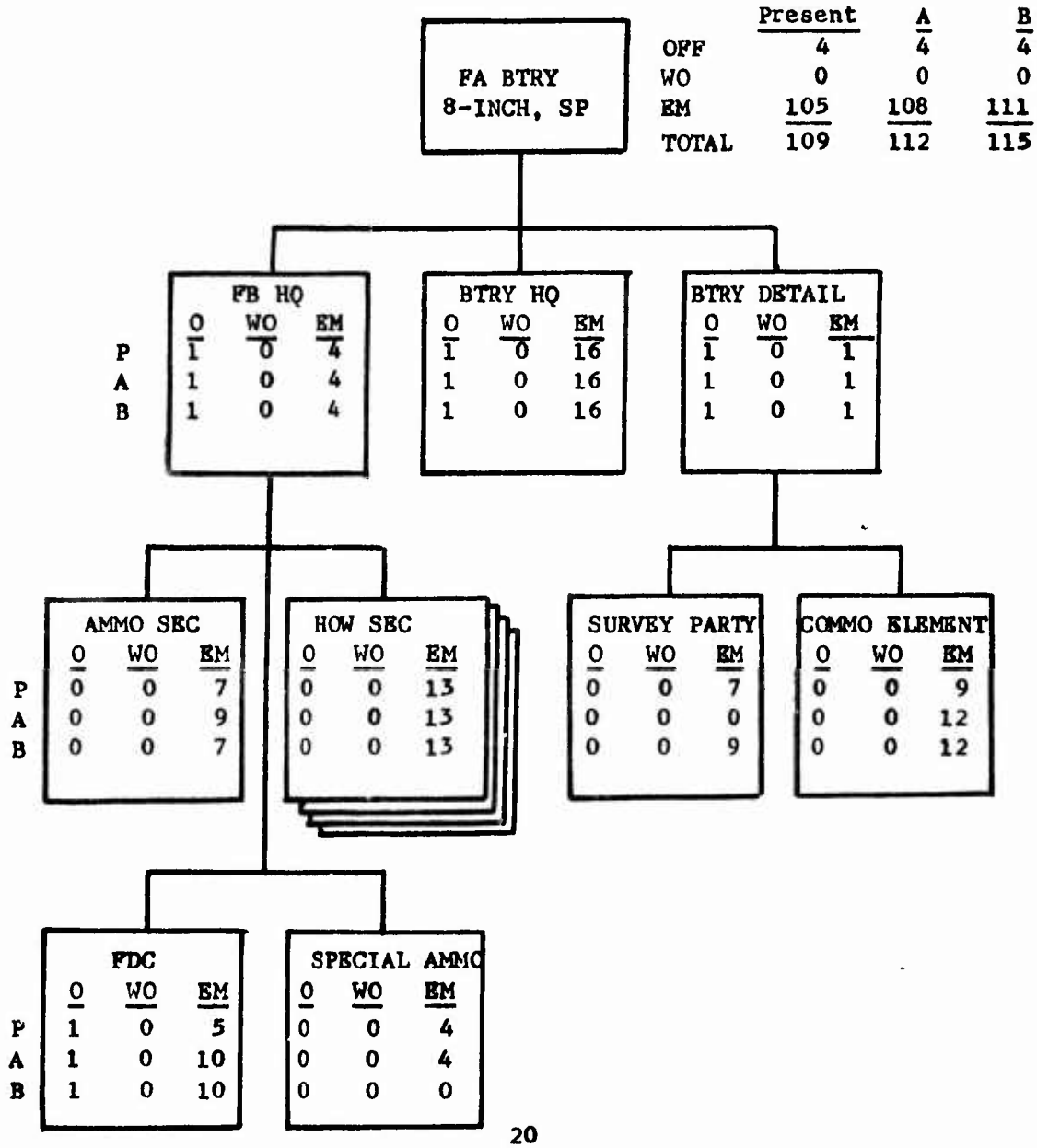


TABLE II-9[22]

FIELD ARTILLERY BATTERY SURVEY PARTY

	Present	Type A	Type B
Personnel			
E-6 (Chief of Survey Party)	1	0	1
E-5 (Survey Cmpt)	2	0	2
E-4 (Instr Op)	1	0	3
E-4 (Survey Recorder) (Dvr)	1	0	3
E-3 (Rodman-Tapeman) (Dvr)	2	0	0
Equipment (Critical)			
1¼ Ton Trk	1	0	2
AN/PRC 77	2	0	2
Surveying Set, Arty Fire Control, 4th Order	1	0	1
Theodolite, Survey, Direct, 0.2 mil	1	0	3
Surveying Instrument, Dist Measure	0	0	3

TABLE II-10[23]

FIELD ARTILLERY BATTERY COMMUNICATIONS ELEMENT

Personnel

	Present	Type A	Type B
E-6 (Comm Ch)	1	1	1
E-5 (Radio TT Tm Ch)	1	1	1
E-4 (Radio TT Op)	2	2	2
E-4 (Sr Fld Swbd Op)	1	1	1
E-4 (Sr Tac Wire Op Sp)	1	2	2
E-3 (Swbd Op)	1	1	1
E-3 (Tac Wire Op Sp) (Dvr)	2	4	4

Equipment (Critical)

¼ Ton Trk	1	2	2
AN/GRC 142 w/TSEC/KW-7 mounted on 1¼ Ton Trk	1	1	1
Cable, Telephone, WD 1/TT, DR-8, 1¼ mi	12	12	12
Cable, Telephone, WD 1/TT, RL-159/U, 1 mi	7	10	10
Reeling Machine, Cable, Hand, RL 31	1	2	2
Reeling Machine, Cable, Hand, RL 39	9	9	9

TABLE II-11[24]

FIELD ARTILLERY BATTERY AMMUNITION SECTION

	Present	Type A	Type B
Personnel			
E-6 (Sec Ch)	1	1	1
E-5 (Sr Hvy Veh Dvr)	1	1	1
E-4 (Hvy Veh Dvr)	2	3	2
E-3 (Ammo Handlers)	3	4	3
Equipment (Critical)			
Trk 8 Ton M 520	3	4	3

TABLE II-12[25]

FIELD ARTILLERY BATTERY HOWITZER SECTION*

Personnel	
E-6 (Sec Ch)	1
E-5 (Gunner)	1
E-4 (Asst Gunner)	1
E-4 (Motor Carriage Dvr)	1
E-4 (Cargo Carrier Dvr)	1
E-3 (Cannoneer)	8

Equipment (Critical)	
M 110 How (8", SP)	1
Carr Cargo M 548	1

*Organization for Type A and Type B remain the same.

TABLE II-13[26]

FIELD ARTILLERY BATTERY FIRE DIRECTION CENTER

	Present	Type A	Type B
Personnel			
Lt (FDO)	1	1	1
E-6 (Chief FD Cmpt)	0	1	1
E-5 (FD Cmpt)	2	4	4
E-4 (Chart Op)	2	4	4
E-4 (CP Carr Dvr)	1	1	1
Equipment (Critical)			
Carr CP M 577	1	1	1
1¼ Ton Truck	0	1	1
AN/VRC 46	2	2	2
AN/GRA-39	2	2	2
TSEC/KY-38	1	1	1
Computer, Gun Direction	1	1	1
Fire Direction Set, Arty, 25,000 meters	2	2	2
Plotting Board, Indirect Fire, Arty/Inf	2	2	2

TABLE II-14[27]

FIELD ARTILLERY BATTERY

SPECIAL WEAPONS SECTION

Personnel

	Present	Type A	Type B
E-4 (Assembler) (Dvr)	4	4	0

Equipment (Critical)

Trk 2½ Ton Van	1	2	0
Special Weapons Tool Kit	2	2	0

CHAPTER III

METHODOLOGY

Introduction

This chapter outlines the technique that was used for the analysis of the three battalion organizations. The first portion describes the scenario and the target array while the discussion in the last portion centers on the units' deployment on the ground.

Scenario

This situation is based on an assumed attack by an enemy force into Central Europe. The portion used in this scenario developed by the U. S. Army Field Artillery School is an anticipated penetration that could develop in a division area.[1]

General Situation (Table III-1)

The division is deployed in the vicinity of Fulda, Germany. The penetration as depicted in the table reflects the situation thirty hours (H+30) after the enemy begins his attack.[2] The division is defending on an extended front of forty-two kilometers.[3] Twenty-six hours (H+26) after the attack begins, the division receives the authority from Corps to fire its nuclear sub-package at H+30, since it is evident that the division can not contain the enemy without the use of nuclear weapons.

The Array

The sub-package released to the division consists of fifty-three weapons, twenty-one of which are designated for delivery by 8" means.[4] The 8" array is shown as planned in Table III-2. The pulse begins thirty hours after the attack and has a timespan of sixty minutes. The battalion has four hours (H+26 to H+30) in which to prepare for the pulse.[5]

Deployment of Units (Table III-3)

With a tactical mission of general support, the battalion is already deployed to provide artillery support across the entire division front. With this tactical mission it is positioned by the division artillery and answers calls for fire from them only.[6]

Headquarters and Headquarters Battery

Headquarters and headquarters battery, denoted by the battalion symbol in Table III-3, is located ten kilometers west of B battery. HHB is thirty-two kilometers from A battery, thirty-one kilometers from C battery, and eleven kilometers from service battery. Upon receipt of the nuclear release at H+26, the OP/FD Sec updates the firing data for each of the FA batteries' seven aiming points.

Survey control was established to the primary positions of the FA batteries prior to H+26. The battalion survey section is required to survey the alternate firing positions for the FA batteries in organization A.

Wire communications links between HHB, service battery, and B battery are operational. Wire is in the process of being installed to

A and C batteries. All communication is adequate with all batteries. FM communication is adequate to B and service batteries; however, it is weak to A and C batteries, requiring the installation of radio relays.

Service Battery

Service battery is located eleven kilometers south of HHB on a main supply route into the area. Adequate road networks exist to facilitate movement between service battery and the other batteries. Under organization B, service battery's ammunition trains and HHB receive the nuclear release at the same time. At that time the special ammunition section begins assembly of the nuclear projectiles for the FA batteries. After completing the projectile assembly, they are transported to the firing positions.

Field Artillery Batteries

The field artillery batteries are deployed to provide fire support for the entire division. A battery is located to the north with B battery in the center and C battery to the south. Each of the FA batteries is capable of engaging at least seven of the nuclear targets either from its primary or three alternate positions. Each of the alternate positions is at least one kilometer from the primary and other alternate positions. The three FA batteries receive the nuclear release message and their nuclear aiming points simultaneously with the battalion. The FA batteries occupy the alternate positions with a howitzer section and necessary special weapons personnel while firing their portion of the targey array (seven targets).

The survey party in each FA battery begins surveying the alternate positions when nuclear release is received at the battery, except in

organization A where the battalion survey conducts the survey. Also, the communications element starts installing the wire from the primary position to the alternate positions at that time. The special ammunition assemblers have four hours to assemble the nuclear projectiles and transport them, with the assistance of the ammunition section, to the alternate positions.

As the FDC is computing the firing data for the targets, howitzer sections are moving to alternate positions to fire their nuclear projectiles. Sections do not remain in position longer than ten minutes after firing the first round.

TABLE III-1[7]

SITUATION

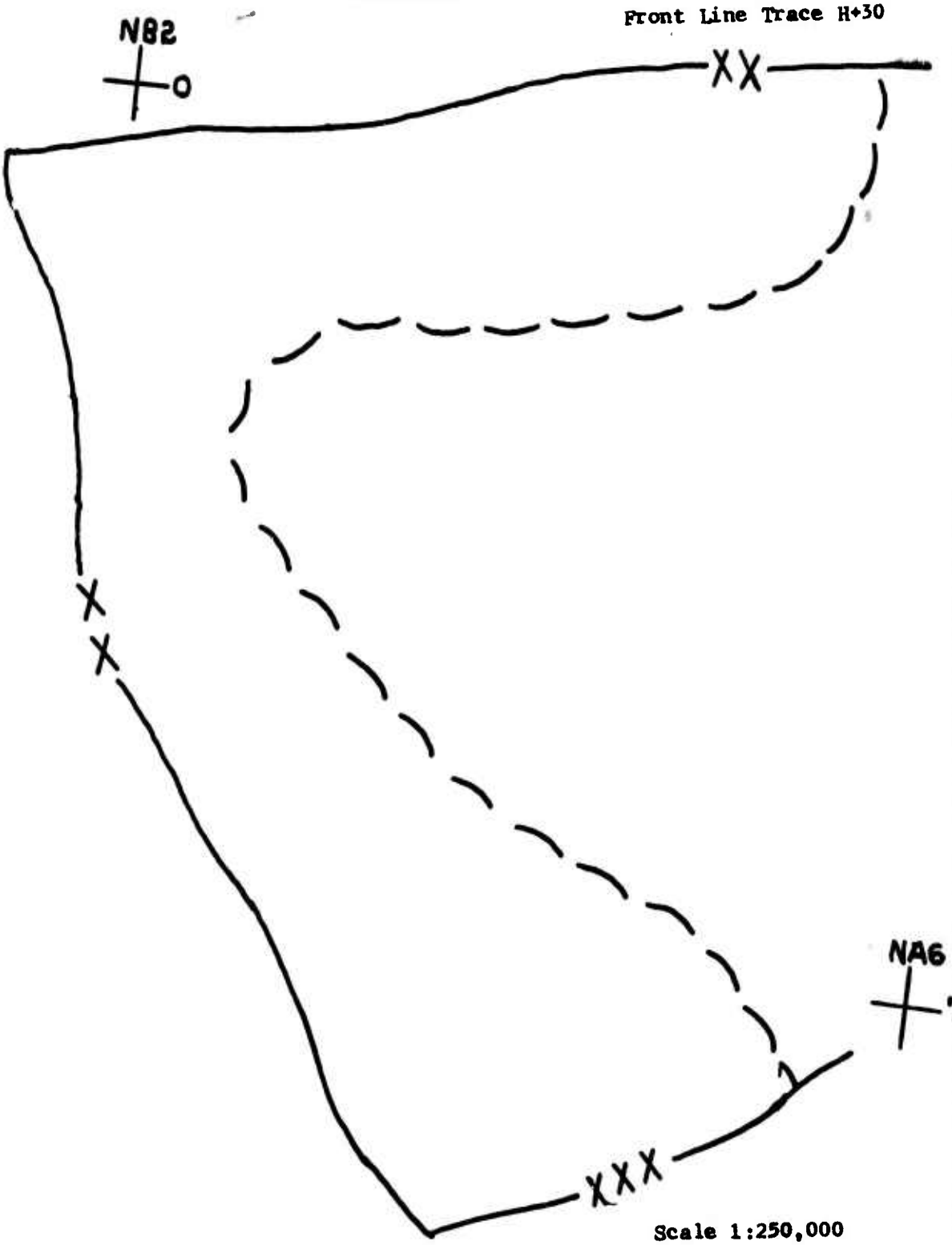


TABLE III-2[8]

TARGET ARRAY

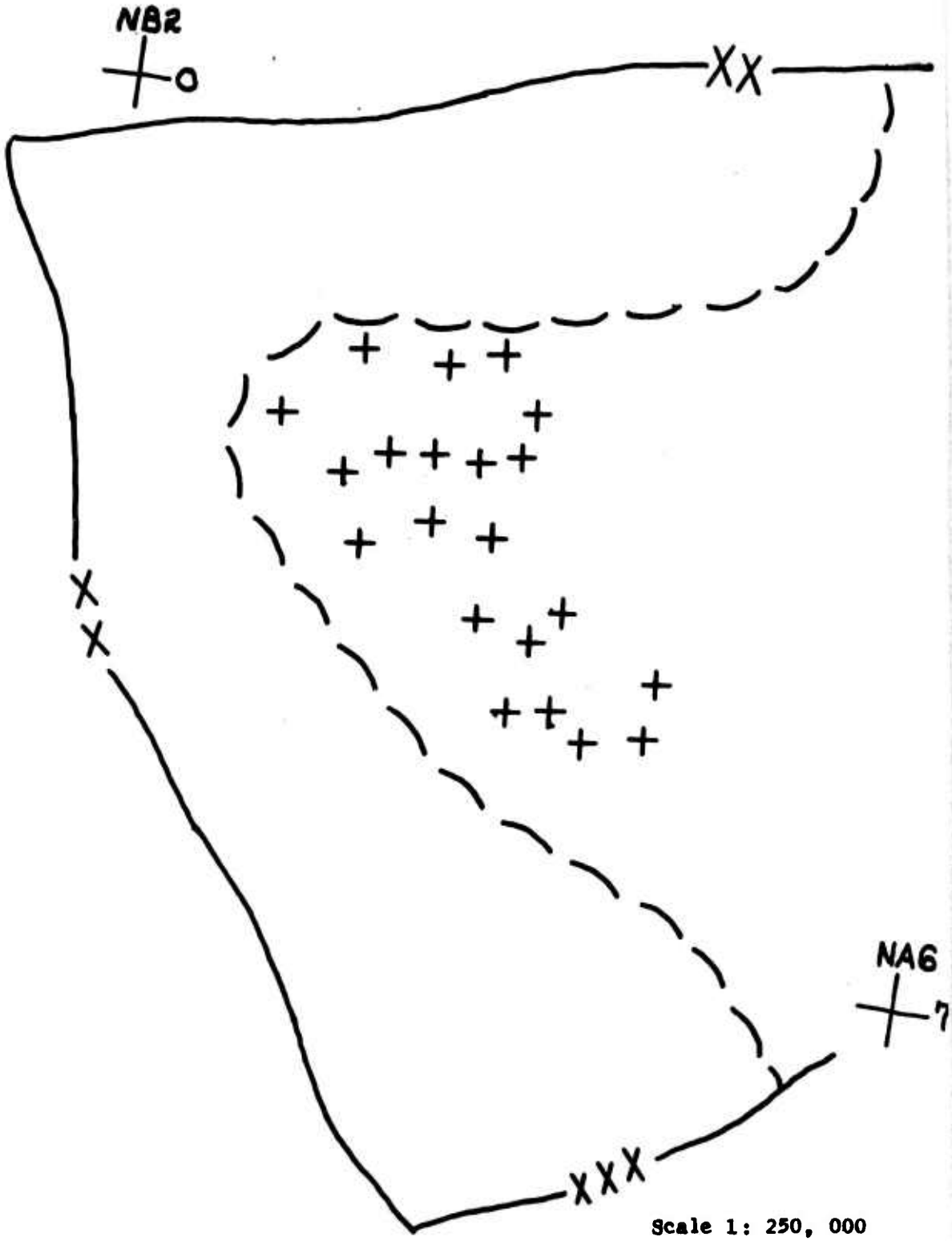
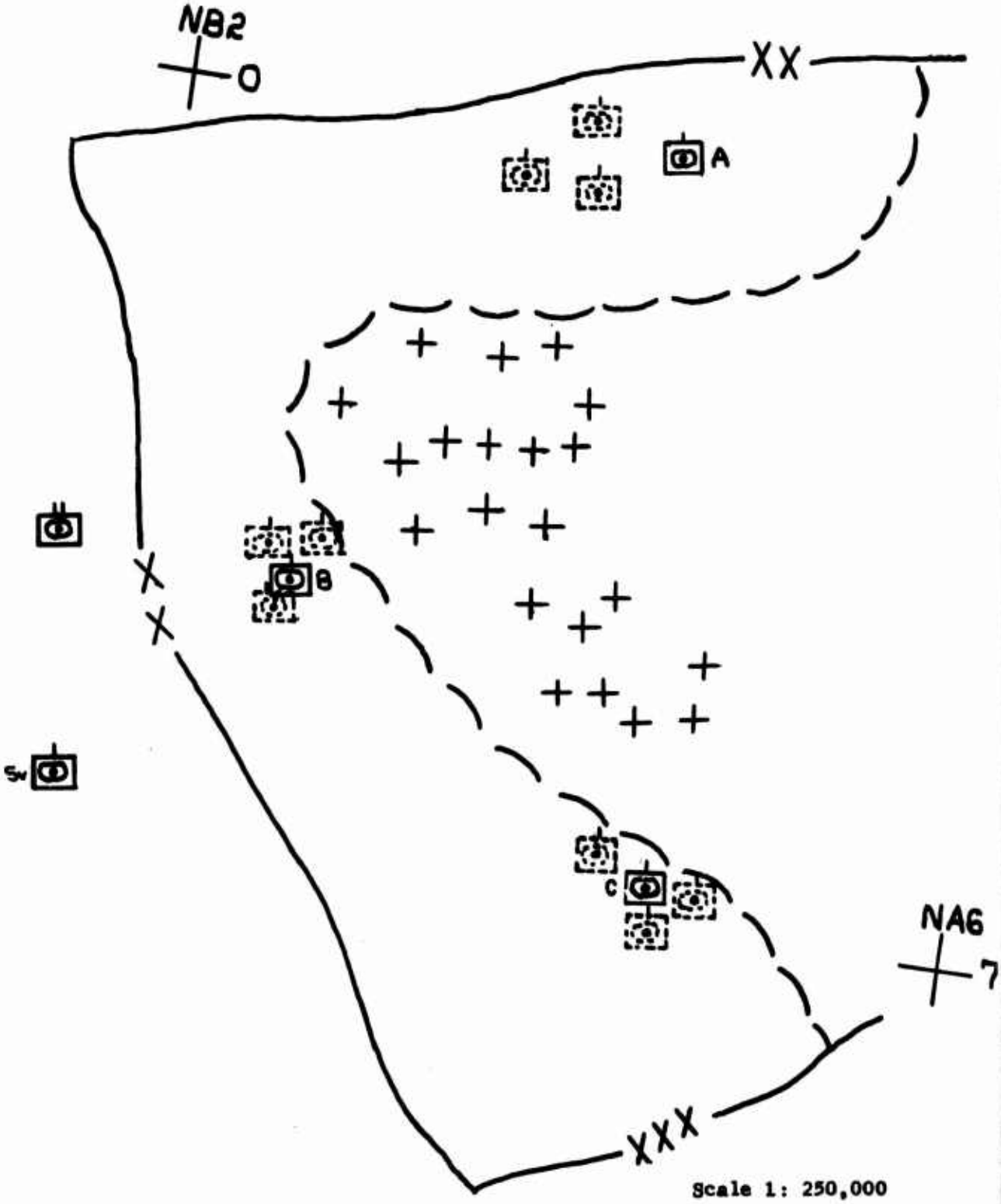


TABLE III-3[9]

DEPLOYMENT OF UNITS



CHAPTER IV

RESULTS

Introduction

Utilizing the situation as outlined in chapter III, this chapter discusses the ability of the battalion to accomplish its nuclear mission. The order of presentation will be an analysis of the battalion's ability to assemble the nuclear weapons, survey the firing positions, compute the firing data, transport the nuclear weapons, communicate, and fire the nuclear weapons. Each sub-element in the battalion having an effect on these parts of nuclear mission accomplishment will be discussed.

Assembly of Nuclear Weapons (Table IV-1)

In analyzing the capabilities of the units to assemble a nuclear weapon, an assembly team will consist of two individuals with an M-5 ASI. The equipment required for each team will be a 2½ ton van and a special weapons tool kit. The time required for each team to assemble a nuclear weapon will be forty-five minutes.[1]

Present Organization

Under the present organization, each battery can assemble five nuclear weapons during the four hours from nuclear release to the firing of the sub-package. A total of fifteen weapons can be assembled for the battalion, which is six weapons short of the number required to fulfill the division sub-package. This deficiency is due to the unavailability

of a second 2½ ton van under the present organization.

Organization A

Organization A doubles the assembly capability of each battery by adding one 2½ ton van. Each battery can assenble ten rounds with a total capability of thirty for the battalion, which in this case exceeds the required number of rounds for the division sub-package.

Organization B

Organization B has the same capabilities of assemblying thirty weapons in a four hour period as organization A. Since the weapons must be transported from service battery to each of the FA batteries, the time available to assemble weapons going to A and C batteries will be shortened by one hour and fifteen minutes, and the assembly time for weapons going to B battery will be shortened by forty minutes. These travel times are based on twenty-five miles from service battery to A and C batteries and thirteen miles from service battery to B battery. The average rate of speed is twenty miles per hour. With the reduction in time available to assemble the weapons, the service battery special ammunition section can assemble twenty weapons for firing within the four hour timespan.

Survey (Table IV-2)

The survey capabilities of the three battalion organizations are analyzed by using a survey rate of one thousand meters per hour for tapemen to tape distances, and thirty minutes for the distance-measuring equipment (DME) to measure distances from two hundred meters to fifty kilometers. Measurements with the DME cannot be made through

land masses or large obstructions; however, small distant objects within the line of sight do not affect the DME.[2]

The survey requirements for each FA battery's alternate firing positions are: A battery--15.5 km, 6 DME measurements; B battery--9 km, 5 DME measurements; and C battery--12.25 km, 7 DME measurements. All surveys are started and closed on the primary battery locations.

Present Organization

Survey cannot be completed in the four hours from nuclear release until the firing of the sub-package in any of the batteries with the existing assets. The battalion survey section could assist any one of the three FA batteries and that battery's survey could be completed; however, the remaining two battery survey parties could not complete their respective surveys alone.

Organization A

The surveys in each FA battery can be completed providing the survey parties do not have to travel from HHB to the FA batteries after nuclear release. With the survey capabilities being centralized at battalion level, the survey parties would normally begin survey of the alternate positions upon completion of the primary position survey.

Organization B

The surveys can be completed in each battery with the addition of the DME to the FA battery survey parties. The battalion survey section could be used as required to assist a FA battery's survey party to complete its survey if it is apparent that the battery cannot complete its survey requirements in the time available.

Computation of Firing Data

The computation and/or verification of firing data begins in the battalion FDC and the FA batteries' FDC's upon nuclear release. The battalion computes the data for all twenty-one DGZ's, and each FA battery computes the data for seven DGZ's. The MET-VE technique is utilized for the computation of the firing data. The time required to compute the firing data for each DGZ is ten minutes.[3]

Present Organization

The battalion FDC can complete the firing data computation in one hour and ten minutes, since it has the ability to compute the data for each battery simultaneously. The FA batteries' FDC's can compute the firing data in the same time required by the battalion FDC. This allows sufficient time for the checking of data between battalion and each FA battery.

Organizations A and B

Organizations A and B do not increase the ability of the FDC's to compute the firing data. These two organizations do increase the capability of each FDC to conduct sustained operations, since under these organizations each FDC has two complete sets of personnel.

Transportation of Nuclear Ammunition

Each 8 ton M 520 truck is capable of transporting nuclear weapons if it is modified with the proper tiedowns, and canvas is available to cover the cargo area. In this situation the only nuclear weapons that are being transported by the battalion are the twenty-one required to fire the sub-package.

Present Organization

In this organization, all the nuclear weapons are being transported by the FA batteries' ammunition sections. Two 8 ton trucks are required in each battery to transport the seven nuclear weapons to the batteries' primary positions.[4] The M 548 cargo carrier and the $2\frac{1}{2}$ ton vans may be utilized to transport the nuclear weapons from the primary positions to the alternate positions for firing. Under the present organization the transportation requirement can be accomplished, but the capability of conventional ammunition resupply may be reduced because of the requirement to transport the nuclear weapons.

Organization A

This organization increases the load carrying capability for conventional ammunition by adding an 8 ton truck. This additional truck does not affect the nuclear mission accomplishment, since adequate vehicles are available for the transportation of nuclear weapons.

Organization B

In organization B, all the nuclear weapons are located in service battery. The transportation requirements to deliver seven nuclear weapons to each FA battery after the assembly operation is completed can be accomplished by two 8 ton trucks for each of the three FA batteries.[5] The twenty-one nuclear weapons cannot be assembled and delivered to the FA batteries in the four hours allotted as previously discussed.

Communications

The communication distances from HHB to each FA battery are stated in the following chart.

	A Btry	B Btry	C Btry	Sv Btry
FM/AM (straight Line)	32 km	10 km	31 km	11 km
Wire (Road Distance)	24 mi	9 mi	24 mi	8 mi
Wire Required (includes 20% slack)	29 mi	11 mi	29 mi	10 mi

The wire required for the FA batteries to install land lines to the alternate positions is: A battery--7 miles, B battery--4 miles, and C battery--4½ miles. Wire has been installed to B battery and service battery prior to nuclear release and installation is in process to A battery and C battery.

AM communications are adequate. FM communications with A battery and C battery are marginal which requires that radio relays be installed. Dual communications with each battery are required in this situation.

Present Organization

The requirement to install wire from HHB to the FA batteries and service battery cannot be accomplished. The battalion communications platoon has a total of 35 miles of wire available to install the wire lines to the FA batteries and service battery.[6] Installation of the wire lines to B battery and service battery require twenty-one miles of wire. The remaining fourteen miles available are not enough to install the wire lines to either A or C batteries. Each of the FA batteries can accomplish the installation of the wire lines to the alternate positions.

FM communications cannot be adequately established with C battery, since the capability to install only one radio relay exists. There is

no dominant terrain behind the front line trace which would facilitate the installation of a single radio relay unit to serve both FA batteries simultaneously. Since FM communications cannot be adequately established with one FA battery and wire communications cannot be established with two of the FA batteries, the requirement of dual communications cannot be accomplished.

Organization A

The wire communications capability for the battalion wire section is the same as presently organized. The FA battery communications element has an additional wire team and three additional miles of wire. The FA battery wire teams can accomplish their mission, as they are capable of doing under the present organization.

This organization provides an additional radio relay capability in the battalion communications platoon. This additional radio relay at battalion insures dual communications with all batteries.

Organization B

Organization B adds a wire team and five miles of wire to the present organization structure. This organization is inadequate since it would require an additional fifteen miles of wire for the battalion wire section to install a wire line to either A or C battery. The FM communications capability is the same as in the present organization, which does not accomplish the requirement of dual communications.

Firing the Nuclear Weapons (Table IV-4)

The total sub-package is fired in forty-one minutes. This is accomplished by A battery and B battery occupying all three alternate

positions and C battery occupying two alternate positions. None of the FA batteries remains in position longer than ten minutes after firing the first nuclear weapon. All three organizations are capable of accomplishing this by occupying two alternate positions simultaneously, and then moving the element from the position that fires the first group of targets to the third alternate position and firing the third group of targets.

Evaluation (Table IV-5)

Present Organization

The field artillery battalion (8", SP) as presently organized does not meet the requirement of timely nuclear mission accomplishment. The fire direction centers at both battalion and the FA batteries can accomplish the task of computing the firing data for the aiming points in the nuclear sub-package. The survey of the alternate firing positions by the survey parties in the FA batteries cannot be accomplished because of the time required for the tapemen to tape the distances required by the survey plan.

Dual communications cannot be established with C battery since the capability for installing only one radio relay exists, and there is not enough wire to install a wire line to C battery after the wire lines have been installed to B battery and service battery. The communications elements in the FA batteries are capable of installing wire to all their alternate positions.

Transportation of the nuclear weapons can be accomplished by the FA batteries with the use of two ammunition vehicles from the sections. Assembly of the nuclear weapons in the sub-package cannot be accomplished

because the FA batteries can assemble only fifteen weapons in the four hours from nuclear release to the beginning of the pulse. The assembly operations are limited because only one assembly van is available in each battery. The firing of the nuclear weapons can be accomplished by the howitzer sections if all the other tasks can be accomplished.

Organization A

The organization of the field artillery battalion (8", SP) under organization A allows the battalion to accomplish its nuclear mission. The firing data computation can be accomplished in the same amount of time, though six EM and one officer are added to the FDC at battalion, and five EM are added to the FA batteries' FDC's.

The survey of the alternate positions in the FA batteries can be accomplished by the survey section at battalion. The centralization of the survey capability at battalion level provides for an increase in survey personnel at battalion to eighteen and a total decrease in the three FA batteries of twenty-one. The addition of one $\frac{1}{4}$ ton truck with a radio relay capability to the communications platoon at battalion provides dual communications with all batteries. The wire capability at battalion is not changed in this organization. The addition of a wire team to the FA batteries doubles their wire laying capability, but it is not needed as it is adequate under the present organization.

Transportation of the nuclear ammunition can be accomplished. While the increase of one truck and two individuals to the ammunition section will increase the conventional ammunition load carrying capability, the addition of a $2\frac{1}{2}$ ton van allows the special weapons element in the FA batteries to assemble a sufficient number of nuclear

weapons by doubling their capabilities. With the accomplishment of all other nuclear mission related tasks, the howitzer sections in the FA batteries can accomplish the timely firing of the nuclear weapons.

Organization B

The field artillery battalion (8", SP) under organization B cannot accomplish its nuclear mission. The computation of the firing data can be accomplished in the same amount of time, though six EM and one officer are added to the FDC at battalion and five EM are added to the FDC's in the FA batteries.

The survey of the alternate positions for the FA batteries can be accomplished by survey parties at the FA battery level. The additions of three DME's, one 1¼ ton truck, two theodolites, and two individuals to each survey party in the FA batteries greatly increase their survey capability. The survey party at battalion retains the same capability as presently organized.

Dual communications with all the batteries cannot be accomplished, even though an additional wire team and an additional five miles of wire are included in the organization of the battalion communications platoon. The capability to establish only one radio relay exists, therefore dual communications cannot be established with C battery. The additional wire team in the FA batteries doubles their wire laying capability, but it was already adequate under the present organization.

Transportation of the nuclear weapons by service battery can be accomplished. Their conventional ammunition load carrying capability will be decreased because of the requirement to transport the nuclear weapons. The assembly of the nuclear weapons cannot be accomplished

because the nuclear weapons must be transported from service battery to the FA batteries to arrive prior to the start of the pulse. If all the other nuclear mission related tasks could be accomplished, the howitzer sections in the FA batteries could successfully fire their nuclear weapons.

Summary

Certain sub-elements of the present organization are capable of accomplishing their portion of the nuclear mission; however, the present organization as a whole cannot accomplish its nuclear mission. The primary limitations of the present organization are its inability to assemble the nuclear weapons, survey the alternate positions, and provide dual communications. Organization B does not accomplish the nuclear mission because of its inability to assemble the nuclear weapons and provide dual communications for the battalion. The only organization that can accomplish the nuclear mission is organization A.

TABLE IV-1

NUCLEAR WEAPONS ASSEMBLY CAPABILITIES

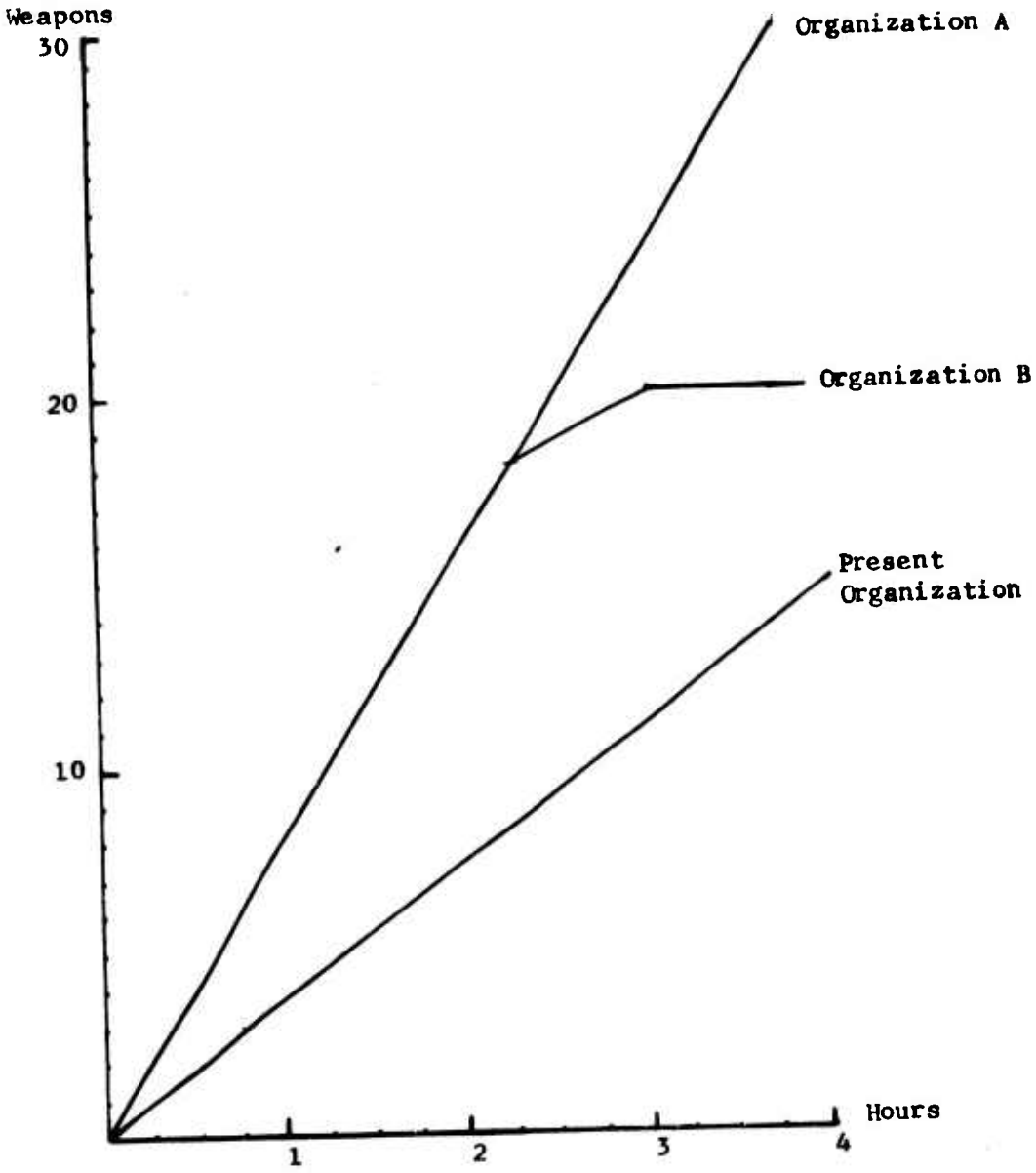


TABLE IV-2

SURVEY CAPABILITIES

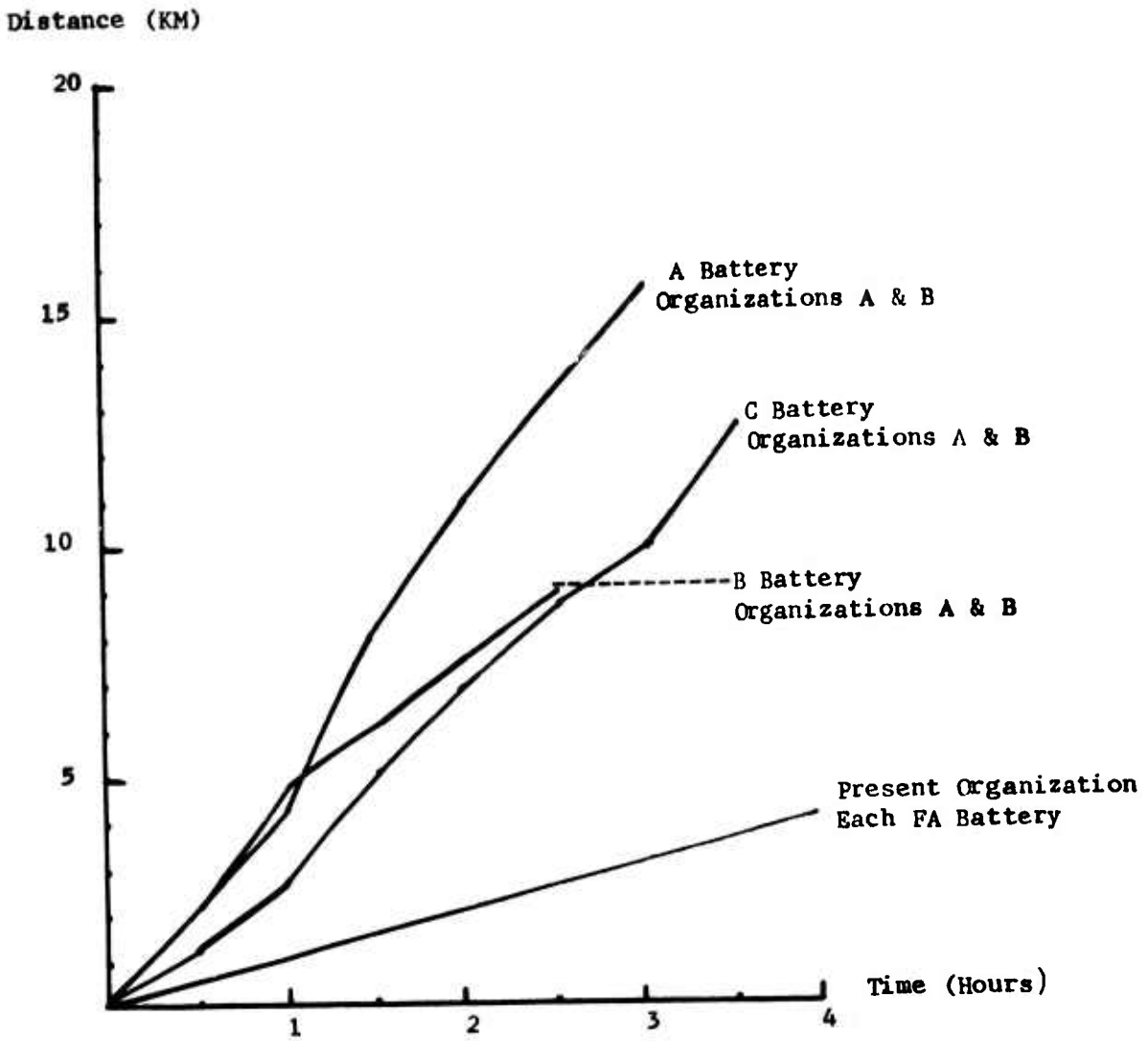


TABLE IV-3

COMMUNICATIONS

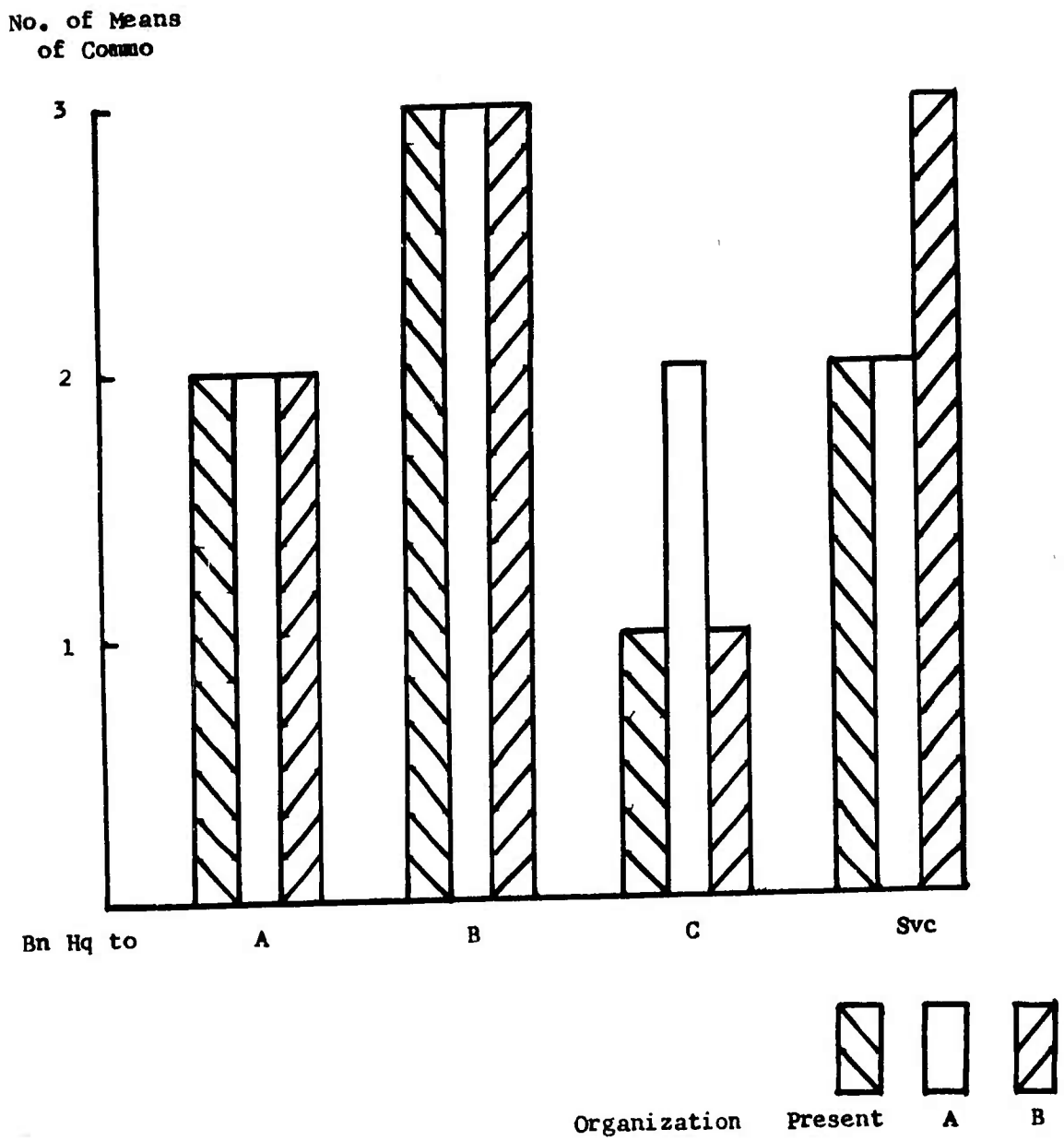


TABLE IV-4

FIRING THE NUCLEAR WEAPONS

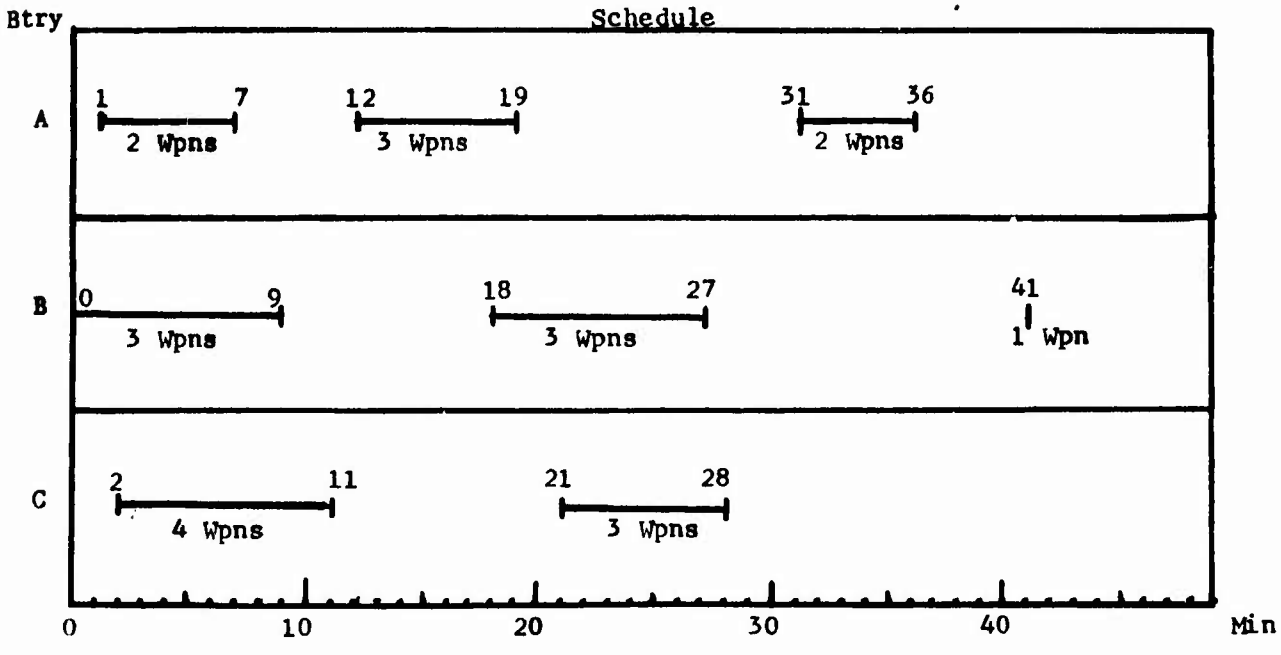


TABLE IV-5

EVALUATION OF CAPABILITIES

	Present	Type A	Type B
Assemble Nuclear Weapons	No	Yes	No*
Survey Alternate Positions	No	Yes	Yes
Compute Firing Data	Yes	Yes	Yes
Transport Nuclear Weapons	Yes	Yes	Yes
Communicate (Dual)	No	Yes	No
Wire			
Battalion to All Batteries	No	No	No
Battery (Primary to Alternate)	Yes	Yes	Yes
Radio			
AM	Yes	Yes	Yes
FM	No	Yes	No
Fire the Nuclear Weapons	Yes	Yes	Yes

*Weapons cannot be assembled because of the travel time required to transport the weapons from service battery to the FA batteries.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

An examination was made of each sub-element within the three battalion organizations which had a direct effect on the ability of these battalions to accomplish their nuclear missions. A division size portion of a typical European scenario was used as the vehicle for analysis of the three battalion organizations.[1] This scenario envisions a massive attack by an aggressor force in the Fulda, Germany area with a U. S. division defending on a front of forty-two kilometers.[2] Twenty-six hours after the attack began, nuclear release was received for the division sub-package with the sixty minute nuclear pulse beginning four hours later.[3] The analysis was conducted on the ability of the battalions to assemble the nuclear weapons, survey the firing positions, compute the firing data, transport the nuclear ammunition, and communicate during the four hour period from nuclear release to the beginning of the pulse. During the sixty minute timespan allowed for the pulse, the battalion organizations were analyzed for their ability to transport the nuclear ammunition, communicate, and fire the nuclear weapons. Only battalion organization A was found to be adequate to perform its nuclear mission. Both the present organization and organization B had sub-elements that could accomplish their particular portion of the nuclear mission, but neither organization could accomplish the complete nuclear mission.

Conclusions

1. The field artillery battalion (8", SP) as presently organized cannot accomplish its nuclear mission because it cannot assemble the nuclear weapons, provide dual communications, and survey the alternate firing points.

2. The organization of the field artillery battalion (8", SP) under organization A can accomplish its nuclear mission; however, it does not represent the most efficient organization of the battalion. Organization A adds personnel and equipment to the battalion fire direction center that are not required for computing the nuclear firing data. It also adds personnel and equipment to the ammunition sections, fire direction centers, and the communications elements in the three FA batteries that are not necessary for accomplishment of their tasks related to the nuclear mission.

3. The field artillery battalion (8",SP) under organization B fails to accomplish its nuclear mission because it cannot assemble the nuclear weapons and provide dual communications.

Recommendations (Table V-1)

Consideration should be given to changing the TOE's of the battalion HHB and the FA batteries to result in an organization capable of accomplishing the nuclear mission. A vehicle should be added to each of the special weapons elements in the FA batteries allowing them to double their ability to assemble nuclear weapons. An additional radio relay capability with personnel added to the communications platoon in HHB would insure dual communications with all batteries. The survey parties in the FA batteries should be deleted from the TOE.

and two additional survey parties added to the survey section in HHB. This reduces the total number of survey personnel in the battalion, but increases their capability through the addition of survey equipment. The total changes to the battalion consist of a few items of equipment and one less enlisted man. The total number of vehicles remains the same.

Further research should be conducted to determine the capability of the battalion to transport conventional ammunition, and the feasibility of using wire communications in the European environment.

TABLE V-1

RECOMMENDATIONS FOR CHANGES TO TOE'S

	Present	Proposed	Changes
Special Weapons Elements (FA batteries)			
Trk 2½ Ton Van	1	2	+ 1
Communications Platoon (Battalion)			
EM	31	33	+ 2
¼ Ton Truck	2	3	+ 1
AN/VRC 49	1	2	+ 1
Survey Section (Battalion)			
EM	11	29	+18
1¼ Ton Truck	2	6	+ 4
AN/PRC 77	3	7	+ 4
Altimeter, Surveying, 4,500 meters	3	9	+ 6
Surveying Instrument, Az Gyro	1	3	+ 2
Surveying Instrument, Dist Measure	3	9	+ 6
Survey Set, Arty Fire Control 4th Order	1	3	+ 2
Theodolite, Survey Direct, 0.2 mil	3	9	+ 6
Survey Party (FA batteries, total)			
EM	21	0	-21
1¼ Ton Truck	6	0	- 6
Survey Set, Arty Fire Control 4th Order	3	0	- 3
Theodolite, Survey Direct, 0.2 mil	3	0	- 3

END NOTES

END NOTES

Chapter I

[1] U. S. Department of the Army, Fire Support for Combined Arms, FM 6-20 (Coordination Draft) (Washington: U. S. Government Printing Office, July, 1976), p. 2-1.

[2] U. S. Department of the Army, Table of Organization and Equipment, TOE 6-395H (Washington: U. S. Government Printing Office, November, 1970), p. 1.

[3] Ibid. pp. 1-6.

[4] U. S. Army Command and General Staff College, Tactical Nuclear Operations-Doctrine, RB 100-30, Vol. I (Ft. Leavenworth: USACGSC, June, 1975), p. 3-6.

[5] LTC William V. Murry, "How to Fight, Tac Nuc Doctrine," (mimeographed document, USACGSC, March 1976), p. 11.

[6] Ibid.

[7] Ibid.

[8] U. S. Department of the Army, Dictionary of U. S. Army Terms, AR 310-25 (Washington: U. S. Government Printing Office, June, 1972), p. 527.

[9] Murry, "How to Fight, Tac Nuc Doctrine," op. cit.

[10] Ibid.

[11] U. S. Department of the Army, AR 310-25, op. cit., p. 573.

[12] U. S. Army Command and General Staff College, RB 100-30, Vol. I, op. cit., p. 4-1.

[13] Ibid., p. c-4.

Chapter II

[1] U. S. Department of the Army, Table of Organization and Equipment, TOE 6-395H (Washington: U. S. Government Printing Office, November, 1970), p. 2.

[2] U. S. Army Command and General Staff College, Tactical Nuclear Operations-Doctrine, RB 100-30, Vol. I (Ft. Leavenworth: USACGSC, June, 1975), p. 3-4.

[3] U. S. Department of the Army, Fire Support for Combined Arms, FM 6-20 (Coordination Draft) (Washington: U. S. Government Printing Office, July, 1976), p. 2-2.

[4] U. S. Department of the Army, Field Artillery Survey, FM 6-2 (Washington: U. S. Government Printing Office, June, 1970) p. 2-1.

[5] TOE 6-395H, op.cit., p. 9.

[6] U. S. Department of the Army, Table of Organization and Equipment, TOE 6-399H (Washington: U. S. Government Printing Office, November, 1970), p. 8.

[7] U. S. Department of the Army, Enlisted Career Management Fields and Military Occupational Specialties, AR 611-201 (Washington: U. S. Government Printing Office, January, 1974), p. 12-13.

[8] U. S. Department of the Army, Table of Organization and Equipment, TOE 6-397H (Washington: U. S. Government Printing Office, November, 1970), pp. 7, 13.

[9] Ibid., pp. 8, 15.

[10] AR 611-201, op. cit., p. 12-13.

[11] U. S. Department of the Army, 175-mm Gun M 107 Self-Propelled and 8-Inch Howitzer M 110 Self-Propelled, FM 6-94 (Washington: U. S. Government Printing Office, May, 1968), p. 6.

[12] U. S. Department of the Army, Field Artillery Cannon Gunnery, FM 6-40 (Washington: U. S. Government Printing Office, June, 1974), pp. 18-12, 24-20.

[13] AR 611-201, op. cit., p. 12-10.

[14] TOE 6-395H, op. cit., p. 2.

Chapter II

[1] U. S. Department of the Army, Table of Organization and Equipment, TOE 6-395H (Washington: U. S. Government Printing Office, November, 1970), p. 2.

[2] U. S. Army Command and General Staff College, Tactical Nuclear Operations-Doctrine, RB 100-30, Vol. I (Ft. Leavenworth: USACGSC, June, 1975), p. 3-4.

[3] U. S. Department of the Army, Fire Support for Combined Arms, FM 6-20 (Coordination Draft) (Washington: U. S. Government Printing Office, July, 1976), p. 2-2.

[4] U. S. Department of the Army, Field Artillery Survey, FM 6-2 (Washington: U. S. Government Printing Office, June, 1970) p. 2-1.

[5] TOE 6-395H, op.cit., p. 9.

[6] U. S. Department of the Army, Table of Organization and Equipment, TOE 6-399H (Washington: U. S. Government Printing Office, November, 1970), p. 8.

[7] U. S. Department of the Army, Enlisted Career Management Fields and Military Occupational Specialties, AR 611-201 (Washington: U. S. Government Printing Office, January, 1974), p. 12-13.

[8] U. S. Department of the Army, Table of Organization and Equipment, TOE 6-397H (Washington: U. S. Government Printing Office, November, 1970), pp. 7, 13.

[9] Ibid., pp. 8, 15.

[10] AR 611-201, op. cit., p. 12-13.

[11] U. S. Department of the Army, 175-mm Gun M 107 Self-Propelled and 8-Inch Howitzer M 110 Self-Propelled, FM 6-94 (Washington: U. S. Government Printing Office, May, 1968), p. 6.

[12] U. S. Department of the Army, Field Artillery Cannon Gunnery, FM 6-40 (Washington: U. S. Government Printing Office, June, 1974), pp. 18-12, 24-20.

[13] AR 611-201, op. cit., p. 12-10.

[14] TOE 6-395H, op. cit., p. 2.

Chapter II (continued)

[15] U. S. Department of the Army, Table of Organization and Equipment, TOE 6-396H (Washington: U. S. Government Printing Office, November, 1970), p. 2.

[16] U. S. Army Field Artillery School, Field Artillery Reference Data, ST 6-1-1 (Ft. Sill: Tactics/Combined Arms Department, January, 1975), pp. 3-32-3-36.

[17] Ibid.

[18] Ibid.

[19] TOE 6-399H, op. cit., p. 2.

[20] ST 6-1-1, op. cit., pp. 3-41-3-44.

[21] TOE 6-397H, op. cit., p. 2.

[22] ST 6-1-1, op, cit., pp. 3-37-3-40.

[23] Ibid.

[24] Ibid.

[25] Ibid.

[26] Ibid.

[27] Ibid.

Chapter III

[1] U. S. Army Field Artillery School, Computer print-out of Corps Nuclear Package for Central Europe (Ft. Sill: U. S. Army Field Artillery School, January, 1976), Target Array, H+30 Hours (Southern Sub-package).

[2] Ibid.

[3] U. S. Army Command and General Staff College, Forward Deployed Force Operations (European Setting), M 3161 (Ft. Leavenworth: USACGSC, 1975), Map A.

[4] U. S. Army Field Artillery School, op. cit.

Chapter III (continued)

[5] LTC William V. Murry, "How to Fight, Tac Nuc Doctrine," (mimeographed document, USACGSC, March, 1976), p. 27.

[6] U. S. Department of the Army, Fire Support for Combined Arms, FM 6-20 (Coordination Draft) (Washington: U. S. Government Printing Office, July, 1976), pp. 2-15, 2-16.

[7] U. S. Army Command and General Staff College, M 3161, op. cit.

[8] U. S. Army Field Artillery School, Computer print-out, op. cit.

[9] Ibid.

Chapter IV

[1] U. S. Army Field Artillery School, Field Artillery Nuclear Control Concept (Draft), presented to Headquarters TRADOC on 29 September, 1975, Slide Control # 761857-23.

[2] U. S. Department of the Army, Field Artillery Survey, FM 6-2 (Washington: U. S. Government Printing Office, June, 1970),pp. 5-2, 6-25.

[3] U. S. Department of the Army, Field Artillery Battalion Medium/Composit, ATT 6-165 (Washington: U. S. Government Printing Office, October, 1970), p. 19.

[4] U. S. Department of the Army, Staff Officers Field Manual: Nuclear Weapons Employment Effects Data (Classified) (U), FM 101-31-2 Final Draft (Washington: U. S. Government Printing Office, September, 1975), p. 2-4.

[5] Ibid.

[6] U. S. Department of the Army, Table of Organization and Equipment, TOE 6-396H (Washington: U. S. Government Printing Office, November, 1970), p. III-05.

Chapter V

[1] U. S. Army Field Artillery School, Computer print-out of Corps Nuclear Package for Central Europe (Ft. Sill: U. S. Army Field Artillery School, January, 1976), Target Array, H+30 Hours, (Southern Sub-package).

Chapter V (continued)

[2] U. S. Army Command and General Staff College, Forward Deployed Forces Operations (European Setting), M 3161 (Ft. Leavenworth: USACGSC, 1975), Map A.

[3] LTC William V. Murry, "How to Fight, Tac Nuc Doctrine," (mimeographed document, USACGSC, March, 1976), p. 27.

BIBLIOGRAPHY

BIBLIOGRAPHY

Cock, William H. The Field Artillery Battalion on the Nuclear Battlefield. Ft. Leavenworth, Kansas: Student Thesis for the Command and General Staff College, 1975.

Lundquist, Loren G. The Nuclear Weapon Capabilities Required to Support The Military and Political Uses of Nuclear Weapons Envisioned by Selected Civilian Strategic Thinkers. Ft. Leavenworth, Kansas: Student Thesis for the Command and General Staff College, 1975.

Murry, LTC William V. "How to Fight, Tac Nuc Doctrine." Mimeographed document published by USACGSC, Ft. Leavenworth, Kansas, March, 1976. Copies may be obtained through the Department of Tactics, USACGSC.

U. S. Army Command and General Staff College. Forward Deployed Force Operations (European Setting), M 3161. Ft. Leavenworth: USACGSC, June, 1975.

_____. Tactical Nuclear Operations-Doctrine, RB 100-30, Vol. I. Ft. Leavenworth: USACGSC, June, 1975.

_____. Tactical Nuclear Operations-Policy, RB 100-30, Vol. II. Ft. Leavenworth: USACGSC, August, 1975.

U. S. Army Field Artillery School. Field Artillery Nuclear Control Concept (Draft). Ft. Sill: U. S. Army Field Artillery School, September, 1975. Slide Control # 761857-23.

_____. Field Artillery Reference Data, ST 6-1-1. Ft. Sill: Tactics/ Combined Arms Department, January, 1975.

_____. Computer print-out of Corps Nuclear Package for Central Europe, Targey Array, H+30 Hours (Southern Sub-Package). Ft. Sill: U. S. Army Field Artillery School, January, 1976. Copies may be obtained through the Department of Tactics, USACGSC.

U. S. Army Training and Doctrine Command. Military Publications Reference Digest of Tables of Organization and Equipment (TOE). Ft. Monroe: U. S. Army Training and Doctrine Command, May, 1975.

U. S. Department of the Army. Dictionary of United States Army Terms, AR 310-25. Washington: U. S. Government Printing Office, June, 1972.

_____. Enlisted Career Management Fields and Military Occupational Specialties, AR 611-201. Washington: U. S. Government Printing Office, January, 1974.

_____. Field Artillery Battalion Medium/Composit, ATT 6-165. Washington: U. S. Government Printing Office, October, 1970.

_____. Field Artillery Cannon Cunnery, FM 6-40. Washington: U. S. Government Printing Office, June, 1974.

_____. Field Artillery Communications, FM 6-10. Washington: U. S. Government Printing Office, March, 1975.

_____. Field Artillery Organization, FM 6-140. Washington: U. S. Government Printing Office, April, 1973.

_____. Field Artillery Survey, FM 6-2. Washington: U. S. Government Printing Office, June, 1970.

_____. Fire Support for Combined Arms Operations, FM 6-20 (Coordination Draft). Washington: U. S. Government Printing Office, July, 1976.

_____. Staff Officers Field Manual: Nuclear Weapons Employment Effects Data (U) (Classified), FM 101-31-2 (Final Draft). Washington: U. S. Government Printing Office, September, 1975.

_____. 175-MM Gun M 107 Self-Propelled and 8-Inch Howitzer M 110 Self-Propelled, FM 6-94. Washington: U. S. Government Printing Office, May, 1968.

_____. Table of Organization and Equipment, TOE 6-395H. Washington: U. S. Government Printing Office, November, 1970.

_____. Table of Organization and Equipment, TOE 6-396H. Washington: U. S. Government Printing Office, November, 1970.

_____. Table of Organization and Equipment, TOE 6-397H. Washington: U. S. Government Printing Office, November, 1970.

_____. Table of Organization and Equipment, TOE 6-399H. Washington: U. S. Government Printing Office, November, 1970.